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M.Sc. (CBS) Ist Semester Examination

CHEMISTRY

[Inorganic Chemistry (Theory-I)]

(DSC)

Paper–CMEM-101

Time : Three Hours] [Max. Marks : 80

Note : Attempt *five* questions in all, selecting *one* question from each unit.

UNIT–I

1. (a) What is symmetry element? Discuss symmetry elements and operation required in specifying molecular symmetry.

   (b) Deduce the symmetry and point group of following molecules :

   (i) 1,2-dichlorobenzene.

   (ii) Ferrocene. (8+8=16)

2. (a) Derive the complete matrices for all representations of C_{2V} group.

   (b) Describe the application of group theory for bonding in tetrahedral geometry. (8+8=16)

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3. (a) Discuss the factors justifying the need of non-aqueous solution chemistry. What are the characteristics of ionising solvents?

(b) What are the principle species expected in the solution of following solutes in water and anhydrous sulphuric acid :

$NaOH$, $(NH_4)_2 SO_4$, urea. (7+9=16)

4. (a) Discuss self ionisation, acid base neutralisation reaction, solvolytic reactions and formation of transition metal fluoride in bromine trifluoride.

(b) $HClO_4$, the strongest acid in aqueous medium acts only as weak acid in conc. sulphuric acid. Why? (14+2=16)

UNIT–III

5. (a) What is Wades rule? $Os_6 (CO)_{18}$ has a monocapped TBP structure. Upon adding two electrons, the structure changes to octahedral. Explain the observation on the basis of Wade's rule.

(b) What are boron hydrides? Describe their preparation, structure and bonding in detail. (6+10=16)

6. Explain synthesis, preparation, bonding and applications of transition metal complexes bonded to hydride anions. (16)

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7. (a) What is chelation? Discuss various factors determining the stability of chelates.

   (b) Discuss the use of thiosemicarbazones and dithiazones in chemotherapy. (8+8=16)

8. (a) Write properties of EDTA. Explain its application in chemotherapy and analytical chemistry.

   (b) Enlist common properties of organic reagents. Discuss advantages of organic reagents over inorganic reagents. (10+6=16)

UNIT–V

9. (a) What is the goal of supramolecular chemistry? Discuss some important aspects of supramolecular chemistry.

   (b) What do you understand by molecular recognition? Explain the supramolecular recognition of neutral molecules with the help of suitable examples. (6+10=16)

10. (a) Describe tetrahedral recognition of macrotricyclic crytants.

    (b) What do you understand by molecular receptors? Discuss the principles of molecular receptor design. (8+8=16)

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